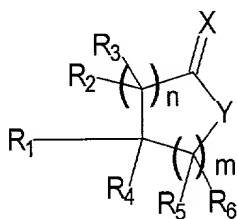


# CLAIMS

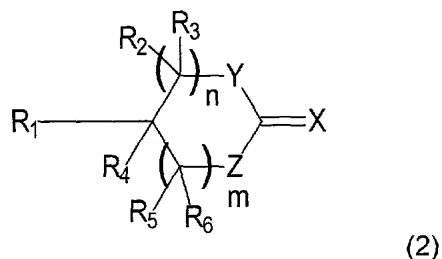
- 1 A radiation curable composition comprising radiation curable components wherein at least one component contains a functional group which, when  
 5 attached to an acrylate group has a calculated Boltzmann average dipole moment of greater than 3.5 Debye, excluding the components 2,3-carbonyldioxypropyl 2-(meth)acryloyloxyethyl carbonate, 3,4-carbonyldioxybutyl 2-(meth)acryloyloxyethyl carbonate, 5,6-carbonyldioxyhexyl 2-(meth)acryloyloxyethyl, the acrylate of beta-hydroxyethyloxazolidone and 2-oxo-1,3-dioxolan-4-yl-methyl acrylate.
- 10 2 The radiation curable composition of claim 1, wherein the components comprise  
 A a radiation curable oligomer (A) and  
 B a diluent (B)
- 15 3 The radiation curable composition of claim 2, wherein the diluent (B) is a reactive diluent (B).
- 4 The radiation curable composition according to anyone of claims 1-3, wherein the functional group, when attached to an acrylate group, has a Boltzmann average dipole moment of higher than 4.5 Debye.
- 20 5 The radiation curable composition according to anyone of claims 1-4, wherein one or more components are present that are chosen from the group consisting of lactones (C1) according to the formula (1):



(1)

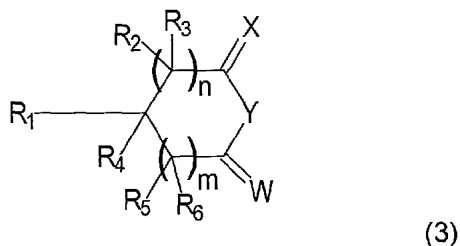
- 25 wherein R<sub>1</sub> = organic group with a molecular weight between 40 and 20000; R<sub>2</sub>, R<sub>3</sub>, R<sub>4</sub>, R<sub>5</sub>, R<sub>6</sub> and R<sub>7</sub> are independently of each other H, an alkyl group having 1-20 C atoms, wherein the alkyl group can be linear, branched or cyclic and may contain heteroatoms like =N, O, S and P; X is an oxygen or sulfur atom; Y is an oxygen or sulfur atom or an NR<sub>7</sub>-group;
- 30 n is 0-4; m is 0-4 and n+m =1-4;

or cyclic carbonates (C2) according to formula (2):



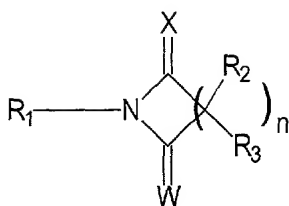
5 wherein R<sub>1</sub> = organic group with a molecular weight between 40 and 20000; R<sub>2</sub>, R<sub>3</sub>, R<sub>4</sub>, R<sub>5</sub>, R<sub>6</sub> and R<sub>7</sub> are independently of each other H, an alkyl group having 1-20 C atoms, wherein the alkylgroup can be linear, branched or cyclic and may contain heteroatoms like =N, O, S and P or an arylgroup having from 6-20 C-atoms; X is an oxygen or sulfur atom; Y and Z are independently an oxygen or sulfur atom or an NR<sub>7</sub>-group; n is 0-4; m is 0-4 and n+m = 1-4, but excluding the compound wherein n = 1, m = 0, R<sub>2</sub>, R<sub>3</sub>, R<sub>4</sub> = H and R<sub>1</sub>=CH<sub>2</sub>CHCO<sub>2</sub>CH<sub>2</sub> or R<sub>1</sub>=CH<sub>2</sub>CCH<sub>3</sub>CO<sub>2</sub>CH<sub>2</sub>, or compounds (C3) according to the formula (3):

10



15 wherein R<sub>1</sub> = organic group with a molecular weight between 40 and 20000; R<sub>2</sub>, R<sub>3</sub>, R<sub>4</sub>, R<sub>5</sub>, R<sub>6</sub> and R<sub>7</sub> are independently of each other H, an alkyl group having 1-20 C atoms, wherein the alkylgroup can be linear, branched or cyclic and may contain heteroatoms like =N, O, S and P or an arylgroup having from 6-20 C-atoms; X and W are independently an oxygen or sulfur atom; Y is an oxygen or sulfur atom or an NR<sub>7</sub>-group; n is 0-4; m is 0-4 and n+m = 1-4;

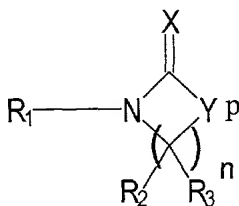
20 or a compound (C4) according to the formula (4):



(4)

wherein  $R_1$  = organic group with a molecular weight between 40 and 20000;  $R_2$ , and  $R_3$ , are independently of each other H, an alkyl group having 1-20 C atoms, wherein the alkylgroup can be linear, branched or cyclic and may contain heteroatoms like =N, O, S and P or an arylgroup having from 6-20 C-atoms; X and W are independently an oxygen or sulfur atom; n is 1-4;

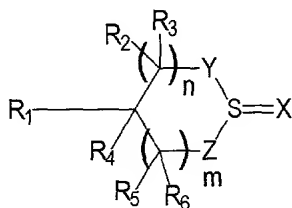
or a compound (C5) according to the formula (5):



(5)

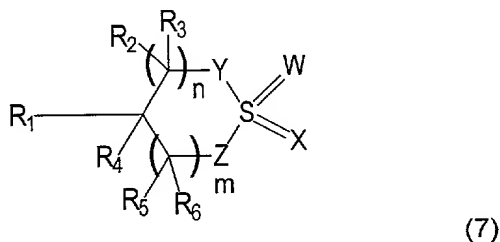
wherein  $R_1$  = organic group with a molecular weight between 40 and 20000;  $R_2$ , and  $R_3$  are independently of each other H, an alkyl group having 1-20 C atoms, wherein the alkylgroup can be linear, branched or cyclic and may contain heteroatoms like =N, O, S and P or an arylgroup having from 6-20 C-atoms; X is an oxygen or sulfur atom; Y is an oxygen or sulfur atom or an  $NR_7$ -group; n is 1-5; p = 0, 1; but excluding a compound wherein  $R_1=CH_2CHCO_2CH_2CH_2$  or  $R_1=CH_2CCH_3CO_2CH_2CH_2$  with n=2, 3 and X = Y = oxygen,

or a compound (C6) according to the formula (6):

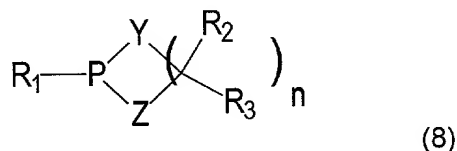


(6)

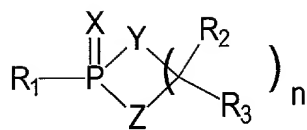
wherein  $R_1$  = organic group with a molecular weight between 40 and 20000;  $R_2, R_3, R_4, R_5, R_6$  and  $R_7$  are independently of each other H, an alkyl group having 1-20 C atoms, wherein the alkylgroup can be linear, branched or cyclic and may contain heteroatoms like =N, O, S and P or an arylgroup having from 6-20 C-atoms; X is an oxygen or sulfur atom; Y and Z are independently an oxygen or sulfur atom or an  $NR_7$ -group; n is 0-4; m is 0-4 and  $n+m = 1-4$ ,  
or a compound (C7) according to the formula (7):



wherein  $R_1$  = organic group with a molecular weight between 40 and 20000;  $R_2, R_3, R_4, R_5, R_6$  and  $R_7$  are independently of each other H, an alkyl group having 1-20 C atoms, wherein the alkylgroup can be linear, branched or cyclic and may contain heteroatoms like =N, O, S and P or an arylgroup having from 6-20 C-atoms; W, X, Y and Z are independently an oxygen or sulfur atom or an  $NR_7$ -group with the proviso that W and X are not both an  $NR_7$ -group at the same time; n is 1-4;  
or a compound (C8) according to the formula (8):



wherein  $R_1$  = organic group with a molecular weight between 40 and 20000;  $R_2, R_3$ , and  $R_7$  are independently of each other H, an alkyl group having 1-20 C atoms, wherein the alkylgroup can be linear, branched or cyclic and may contain heteroatoms like =N, O, S and P or an arylgroup having from 6-20 C-atoms; X is an oxygen or sulfur atom; Y and Z are independently an oxygen or sulfur atom or an  $NR_7$ -group; n is 1-4;  
or a compound (C9) according to the formula (9):



(9)

wherein R<sub>1</sub> = organic group with a molecular weight between 40 and 20000; R<sub>2</sub>, R<sub>3</sub>, and R<sub>7</sub> are independently of each other H, an alkyl group having 1-20 C atoms, wherein the alkylgroup can be linear, branched or cyclic and may contain heteroatoms like =N, O, S and P or an arylgroup having from 6-20 C-atoms; X is an oxygen or sulfur atom; Y is an oxygen or sulfur atom or an NR<sub>7</sub>-group; n is 1-4.

5

6 The radiation curable composition according to claim 5, wherein  
at least one of the R<sub>1</sub> to R<sub>7</sub> groups contains a radiation curable functional  
group.

10

7 The radiation curable composition according to any of claims 2-6,  
wherein the radiation curable oligomer (A) or diluent (B) comprises a NH-  
or OH-group.

8 The radiation curable composition according to claim 7, wherein R<sub>1</sub>  
comprises an NH-group.

15

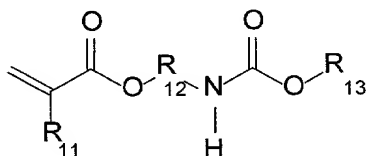
9 The radiation curable composition according to any of claims 1-8,  
wherein the component that contains a functional group also has a  
radiation curable functional group selected from the group consisting of  
methacrylate, acrylate, vinyl ether, fumarate, maleate, itaconate, oxolane  
or epoxy group.

20

10 The radiation curable composition according to claim 9, wherein the  
radiation curable functional group is a methacrylate or an acrylate group.

11 The radiation curable composition according to anyone of claims 1-10,  
wherein a radiation curable diluent is present, which is a compound  
according to the formula (10):

25

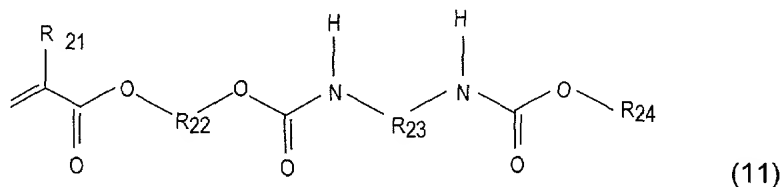


(10)

wherein R<sub>11</sub> = H or Me, R<sub>12</sub> = organic group having 1-20 C-atoms and R<sub>13</sub>

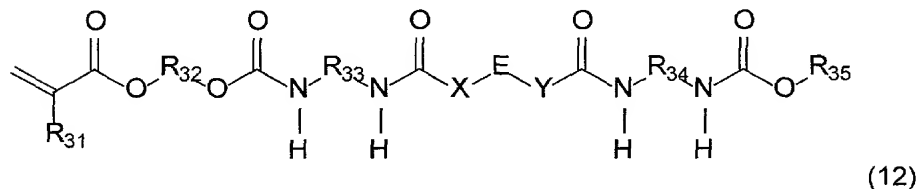
is a heterocyclic group of which the corresponding alcohol has a calculated Boltzmann average dipole moment of > 2.5 Debye.

- 12 The radiation curable composition according to anyone of claims 1-11, wherein a radiation curable diluent is present, which is a compound according to the formula (11):



wherein  $\text{R}_{21} = \text{H}$  or Me,  $\text{R}_{22} =$  organic group having 1-20 C-atoms,  $\text{R}_{23} =$  organic group having 1-20 C atoms and  $\text{R}_{24}$  is a heterocyclic group of which the corresponding alcohol has a calculated Boltzmann average dipole moment of > 2.5 Debye.

- 13 The radiation curable composition according to anyone of claims 1-12, wherein a radiation curable component is present according to the formula (12):



wherein  $\text{R}_{31} = \text{H}$  or Me,  $\text{R}_{32}$ ,  $\text{R}_{33}$  and  $\text{R}_{34} =$  are independently an organic group having 1-20 C atoms, E oligomer or polymer with a molecular weight between 100 and 100000, X and Y are independently oxygen, sulphur or a  $\text{NR}_7$ -group, and  $\text{R}_{35}$  is a heterocyclic group of which the corresponding alcohol has a calculated Boltzmann average dipolemoment of > 2.5 Debye.

- 14 The radiation curable composition according to claim 13, wherein E has a molecular weight between 500 and 10000.
- 15 The radiation curable composition according to any one of claims 1-14, wherein the component that contains a functional group which, when

- attached to an acrylate group, has a calculated Boltzmann average dipole moment of greater than 3.5 Debye or the component containing a heterocyclic group of which the corresponding alcohol has a calculated Boltzmann average dipole moment of greater than 2.5 Debye is present in an amount of at least about 3 wt.% relative to the total amount of components in the composition.
- 5
- 16 The radiation curable composition of claim 15, wherein the component that contains a functional group or the component that contains a heterocyclic group is present in an amount of at least about 5 wt.% relative to the total amount of components in the composition.
- 10
- 17 A process for preparation of the radiation curable compounds as defined in any one of claims 5-14, by reacting together
- (i) an hydroxy-, thiol- or NH-functional (meth)acrylate,
- (ii) a di-or more functional isocyanate, and
- 15 (iii) an hydroxy-, thiol- or NH-functional compound having a calculated Boltzmann average dipole moment of greater than 2.5 Debye.
- 18 A process for preparation of the radiation curable monomers as defined in any one of claims 5-14, by reacting together
- (i) an hydroxy functional (meth)acrylate,
- 20 (ii) a di-functional isocyanate, and
- (iii) a hydroxy functional compound having a calculated Boltzmann average dipole moment of greater than 2.5 Debye.
- 19 A process for preparation of the radiation curable monomers according to any of claims 5 to 14, by reacting together
- 25 (i) one equivalent of an hydroxy functional (meth)acrylate,
- (ii) two equivalents of a di-functional isocyanate,
- (iii) one equivalent of a diamine, dihydroxy or dithiol functional compound with a molecular weight Mn of 1000 or less, and
- (iv) one equivalent of an hydroxy functional compound having a calculated Boltzmann average dipole moment of greater than 2.5 Debye.
- 30
- 20 A process for preparation of the radiation curable oligomer according to any of claims 5 to 14, by reacting together
- (i) one equivalent of an hydroxy functional (meth)acrylate,
- (ii) two equivalents of a di-functional isocyanate,
- 35 (iii) one equivalent of a diamine, dihydroxy or dithiol functional compound

- with a molecular weight  $M_n$  of greater than 1000, and
- (iv) one equivalent of an hydroxy functional compound having a calculated Boltzmann average dipole moment of greater than 2.5 Debye.
- 21 A process for preparation of the radiation curable oligomer according to  
5 any of claims 5 to 14, by reacting
- (i) an hydroxy functional (meth)acrylate,
- (ii) a tri-or more functional isocyanate,
- (iii) an hydroxy functional compound having a calculated Boltzmann  
10 average dipole moment of greater than 2.5 Debye together, and
- (iv) an hydroxy or amine functional oligomer with an average hydroxy or  
amine functionality greater than 1.5.
- 22 Use of radiation curable compositions as defined in claims 1-16 in  
coatings, adhesives, inks.
- 23 Use of a radiation curable composition comprising
- 15 a a radiation curable oligomer (A)
- b a diluent (B)
- as a coating for glass fibers wherein the radiation curable composition  
contains a component having a functional group which has a calculated  
Boltzmann average dipole moment of higher than 2.5 Debye.
- 20 24 Use of the radiation curable composition as defined in anyone of claims  
1- 16 for coating of glass fibers.
- 25 Use of a radiation curable composition comprising
- a a radiation curable oligomer (A)
- b a diluent (B)
- 25 in stereolithography wherein the radiation curable composition contains a  
component having a functional group which has a calculated Boltzmann  
average dipole moment of higher than 2.5 Debye.
- 26 A radiation curable optical fiber primary coating composition comprising
- a a radiation curable oligomer (A)
- 30 b a reactive diluent (B)
- c optionally a photoinitiator (D)
- wherein the radiation curable primary coating composition has a dielectric  
constant of greater than 6.5.
- 27 A radiation curable optical fiber secondary coating composition  
35 comprising



a a radiation curable oligomer (A)

b a reactive diluent (B)

c optionally a photoinitiator (D)

wherein the radiation curable secondary coating composition has a dielectric constant of greater than 7.0.

5

28 A radiation curable optical fiber primary or secondary coating composition comprising

a a radiation curable oligomer (A)

b a reactive diluent (B)

10

c optionally a photoinitiator (D)

wherein the composition has a calculated volumetric thermal expansion coefficient  $\alpha_{23}$  at 23°C of about  $6.85 \times 10^{-4} \text{ K}^{-1}$  or less.

29 A radiation curable optical fiber matrix composition comprising

a a radiation curable oligomer (A)

15

b a reactive diluent (B)

c optionally a photoinitiator (D)

wherein the radiation curable matrix composition has a dielectric constant of greater than 8.75.

30 A radiation curable optical fiber clear composition for an ink composition comprising

20

a a radiation curable oligomer (A)

b a reactive diluent (B)

c optionally a photoinitiator (D)

wherein the radiation curable clear composition has a dielectric constant of greater than 8.25.

25

31 A radiation curable composition according to any one of claims 26-30, wherein the composition comprises at least 3 wt% relative to the total amount of components in the composition of at least one of the components selected from a component that contains a functional group which, when attached to an acrylate group, has a calculated Boltzmann average dipole moment of greater than 3.5 Debye or a component that contains a heterocyclic group of which the corresponding alcohol has a calculated Boltzmann average dipole moment of greater than 2.5 Debye.

30

32 Coated optical fiber comprising a glass optical fiber, a primary coating

applied thereon, a secondary coating applied on the primary coating and optionally an ink composition applied on the secondary coating, wherein at least one of the primary coating, secondary coating or ink composition comprises

- 5           a           a radiation curable oligomer (A)  
            b           a diluent (B), wherein at least one of (A) or (B) is a component having a functional group which has a calculated Boltzmann average dipole moment of higher than 2.5 Debye.

33           Coated optical fiber comprising a glass optical fiber, a primary coating  
10           applied thereon, a secondary coating applied on the primary coating and optionally an ink composition applied on the secondary coating, wherein at least one of the primary coating, secondary coating or ink composition is a radiation curable composition according to any one of claims 1-16 or claims 26-31.

15    34           Optical fiber ribbon comprising a plurality of coated, and optionally colored optical fibers arranged in a plane and embedded in a matrix composition, wherein the coated optical fiber is a fiber according to any one of claims 32-33.

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